Homework 11

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Due April 20

1. Consider the Hald Hamiltonian $H = (1/2)(q_1^2 + q_2^2 + q_1^2 q_2^2 + p_1^2 + p_2^2)$. Find a reduced Hamiltonian $\hat{H} = \hat{H}(q_1, p_1)$ such that $e^{-\hat{H}/T} = \int\int e^{-H/T} dq_2 dp_2$.

2. Find the Fokker-Planck equation that corresponds to the Langevin equation as it is written in Chapter 6, and then show that the canonical density is a stationary solution of the Fokker-Planck equation only if the fluctuation/dissipation relation holds.

3. Derive in detail the Fokker-Planck equation at the end of section 6.1, and then derive the fluctuation/dissipation relation as sketched in the text. (Note: the formulas in the text are full of typos).

4. Check that the relation $\partial\hat{H}/\partial s_1 = E[\partial H/\partial s_1|\hat{s}]$ is sufficient for the validity of the Hald theorems, even when there are no momenta in the Hamiltionian.